S1102 (2) Calculus II Sample Mid-term

July 21st 2015

NAME:_______________________  UNI:_______________________

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Instructions

• There are 7 questions on this exam and you have 95 minutes to finish them.

• No textbooks, cell phones, notes or calculators are allowed.

• Please write neatly, and put your final answer in a box.
1. (15 points)

\[ \int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \frac{\cos^5 x}{\sin^2 x} \, dx \]
2. (15 points) \[ \int \arctan \sqrt{x} \, dx \]
3. (15 points) Find the area of the surface obtained by rotating the curve

\[ y = x^2, \quad 0 \leq x \leq 2 \]

about the y-axis.
4. (a) (10 points) Find the tangent line of the curve

\[ x = t \cos t, \quad y = t \sin t; \quad 0 \leq t \leq 1 \]

at \( t = \frac{\pi}{4} \).

(b) (5 points) Find the length of the above curve.
5. (15 points)

\[ \int \frac{x^3 - 2x^2 - 3}{x^3 - 2x^2 - x + 2} \]
6. (15 points) Determine if the improper integral

$$\int_{1}^{\infty} \frac{e^{\sin x}}{x^3} \, dx$$

is convergent or not.
7. (10 points)

\[ \int \frac{\arctan x}{x^2} \, dx \]